

NEW REPRESENTATION METHOD OF THE KNITTED STRUCTURES USING A PERSONAL COMPUTER

Dorin DAN *

Abstract: *In this paper, the possibility of using the Corel DRAW application for representing knitted structures using a personal computer will be presented. We have created all knitted structure elements as symbols for: face and reverse stitch, tuck stitch, face and reverse float, transferring elements, cast-off loop. The symbols were created and can be stored in library files that are grouped into two collections: symbol representation and needle notation system. The aim is to create teaching tools for drawing used in universities and secondary technical schools.*

Keywords: *fabric knitted structure, needle notation system, and CorelDRAW symbols*

I. INTRODUCTION

The representation of knitted structures by means of a loop diagram with individual structure elements is commonly used, in spite of the fact that the method is difficult and elaborate. In this paper the possibility of transferring knitted structure notation into a loop diagrams using a personal computer will be introduced. The aim is to create symbols for drawing needle notation system using the CorelDRAW graphic suite.

CorelDRAW graphic suite is an intuitive graphics design application that gives designers a more enjoyable work experience. CorelDRAW is built and designed to meet the demands of today's working designer to create ads or collateral for print.

The CorelDRAW application lets us create objects and save them as symbols. Symbols are defined once and can be referenced many times in a drawing. Symbols definitions, as well as information about instances, are stored in a symbol manager, which is part of the CorelDRAW (CDR) file. Using symbols for objects that appear many times in a drawing helps to reduce file size and facilitates the drawing.

Symbols make editing a drawing quicker and easier. Symbols are created from objects. When is converted an object to a symbol, the new symbol is added to the Symbol manager, and the selected object becomes an instance. CorelDRAW can edit a symbol and any changes make affect all instances in a drawing.

II. THE NEEDLE NOTATION SYSTEM

The needle notation system is the most explicit and accurate of all notation systems. It is used to show even the most complicated knitting procedures. It simulates the knitting process on the knitting machine rather than symbolizing the loops. The yarn is drawn as forming loops exactly as in knitting process.

A plain knit structure seen from its face side i.e. produced on the needles of the front bed is simulated in Fig. 1a. The same fabric showing the reverse side i.e. knitted on the needles of the rear needle bed is simulated in Fig. 1b.

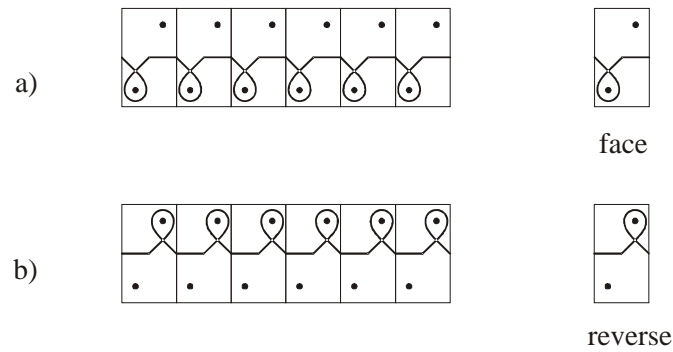


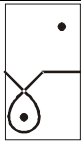
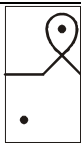


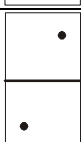
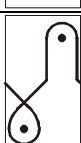
Figure 1. Needle notation system for knit structure on face and reverse side

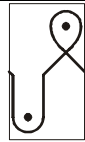
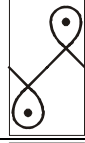



Some of the symbols, which are used in fabric knitted structure, will be explained in Table 1.

Certain basic rules should be observed when the needles notation system is used, to achieve accurate representation in Figure 1. These are:

1. The same number of needles should be drawn in the two lines. These represent all needles in the machine participating in the knitting process.
2. One complete row is drawing by repeating the same graphic symbol.
3. It usually requires much practice and long experience to be descriptive and successful.
4. It is only natural that representation and notation systems have been developed to simplify and shorten the drawing procedure.

Table 1. THE SYMBOLS FOR THE KNITEED STRUCTURE REPRESENTATION

No.	Needle action	Effect description	Symbol
1	Front needle knit and rear needle not work	Face stitch	
2	Front needle not work and rear needle knit	Reverse stitch	
3	Front needle tuck and rear needle not work	Face tuck	
4	Front needle not work and rear needle tuck	Reverse tuck	
5	Front and rear needle not work	Miss stitch (floating)	
6	Front needle knit and rear needle tuck	Face stitch and reverse tuck	

7	Front needle tuck and rear needle knit	Face tuck and reverse stitch	
8	Front and rear needles knit	Rib stitches	
9	Front needle drop stitch	Front needle dropped stitch	
10	Rear needle drop stitch	Back needle dropped stitch	
11	Front needle transfer stitch	Front transferred stitch	

III. CREATING AND USING SYMBOLS FOR DRAWING NEEDLE NOTATION SYSTEM

The symbols are created from objects and the new symbol is added to the Symbol manager, and the selected object becomes an instance. Most of the symbols what should be used have already been created and are stored in library files that are grouped into collections.

CorelDRAW can insert a symbol into a drawing, which creates a symbol instance. It can modify certain properties of a symbol instance, such as size and position, without affecting the symbol definition stored in the library. It can also insert a symbol instance by dragging a symbol from the Symbol manager docker to the drawing window.

In CorelDRAW, each drawing has its own library of symbols, which is part of the CorelDRAW (CDR) file. It can share symbols between drawings by copying and pasting and duplicating. Copying symbols to the Clipboard leaves the originals in the library.

The following object properties can be modified for symbol instances (Table 2). If a symbol contains multiple objects, all objects in the symbol instance are treated collectively as a single object, just as if they were grouped.

Table 2. OBJECTS PROPERTIES

Property	Notes
Position	Objects can be positioned by dragging them to a new location, by nudging, or by specifying their horizontal and vertical position.
Size	Objects can be modified by changing the dimensions proportionally by preserving its aspect ratio.
Scale	Object's dimensions can be modified by specifying values or changing the object directly.
Skew	CorelDRAW can skew and stretch objects . Stretching changes an object's vertical and horizontal dimensions non proportionally.

Mirroring	CorelDRAW can rotate and create mirror images of objects by specifying horizontal and vertical coordinates.
Duplicate	Places a copy directly in the drawing window by specifying horizontal and vertical coordinates.

Symbol instances are copied and pasted in the same way other objects are. Duplicating an object places a copy directly in the drawing window, not the Clipboard. Duplicating is faster than copying and pasting.

Using CorelDRAW application we are drawing theoretical loop shape, in the same rectangular vertical and horizontal frame, as Corel line objects. The symbols are created from this objects and the new symbol is added to the Symbol manager (Figure 2).

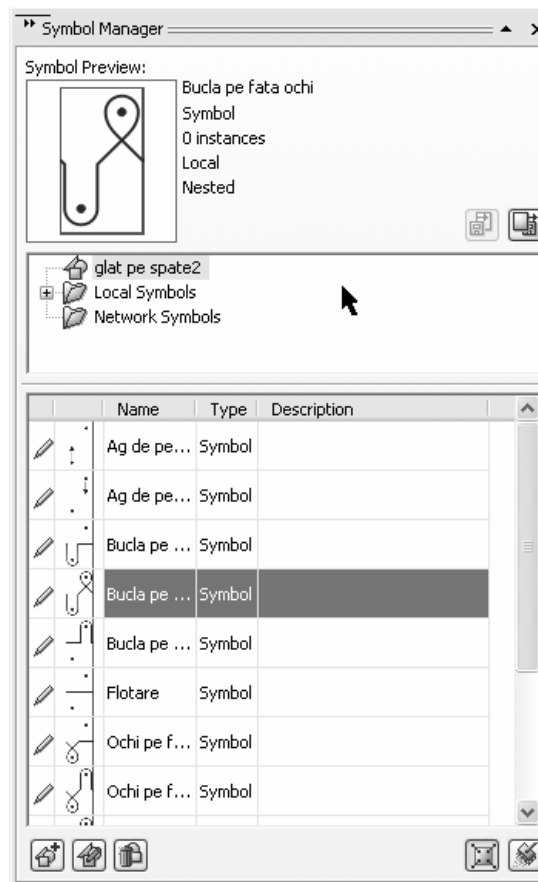


Figure 2. Window "Symbol Manager"

IV. THE ALGORITHMWORKING METHOD

The algorithm working method includes the folowing four steps:

1. We are drawing, in the drawing window, horizontal and vertical guidelines to create a table with the needed number of courses and columns. Guidelines are lines that can be placed anywhere in the drawing window to aid in object placement.
2. We set objects snap to the guidelines to force an object that is being drawn or moved to align automatically to a guideline, or another object.
3. We select a needle symbol notation, and drag and drop it near guidelines.

4. We duplicate the symbol in the drawing window by specifying horizontal and vertical coordinates.

V. RESULTS – EXAMPLES OF KNITTED STRUCTURES

Alongside are a series of knitting patterns produced by some of the most common patterns in the knitwear sector, on which are based nearly all the structured patterns and stitches produced on knitting machines.

Plain is a knit structure family which is produced by the needles of only one needle bed, either front or rear (Figure 3 and 4).

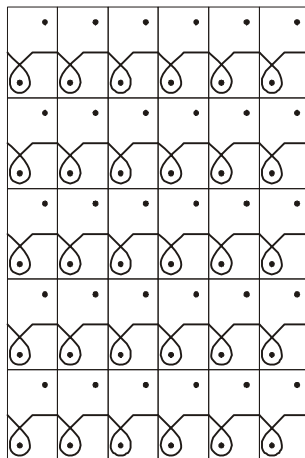


Figure 3. Front single jersey

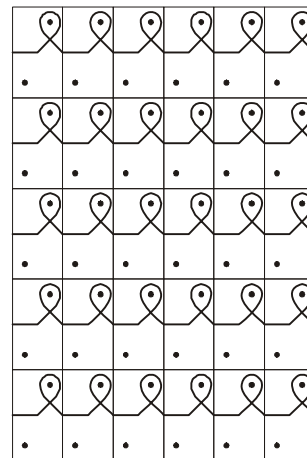


Figure 4. Reverse single jersey

Rib is a knit structure family which is produced by the needles of both beds which alternately ascend to clearing position and then descend to form their loops (Figure 5).

To produce a purl knit structure on a "V" bed flat knitting machine, loop transfer ability is required. In Figure 6 are described simplest 1x1 purl structure.

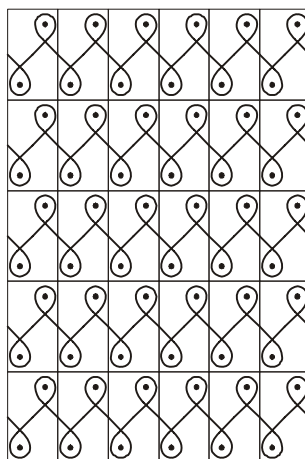


Figure 5. Rib knit

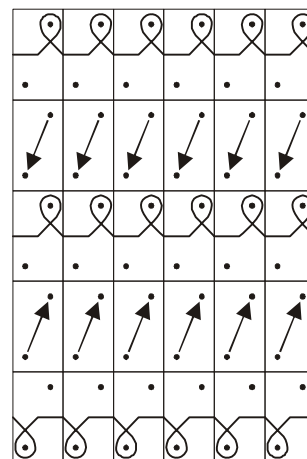


Figure 6. Purl knit

Figure 7 shows the effect created on the face of the fabric by knitting sequence called "Missing", where the yarn is simply drawn as skipping the inactive needle.

Figure 8 shows the effect created by a knitting sequence called "Tucking". The yarn is marked as fed into the needle but without forming a loop.

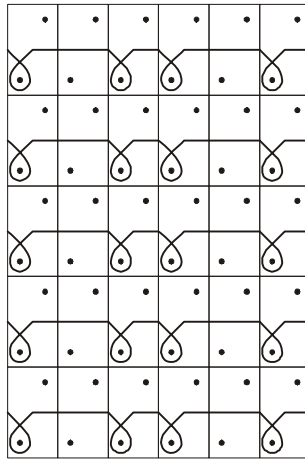


Figure 7. Front single jersey with wide sinker loops

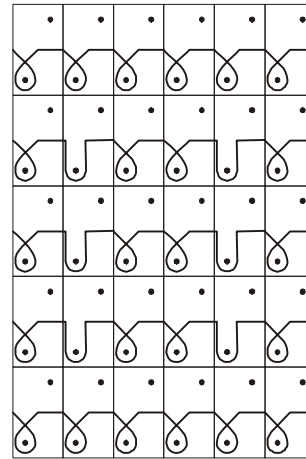


Figure 8. Front single jersey with tuck stitches

The structure called "Full Cardigan" is illustrated in Figure 9. While the front needle bed knits, the needle of the rear bed tucks. In the following sequence, the procedure is reversed. In this way, one course is produced every two knitting cycle and the fabric advances only one course spacing while containing two yarn ends.

Dropped stitches are usually associated with knitting failures. They can however be employed to pattern a fabric, if used according to a controlled procedure. A dropped stitch has a special notation symbol - an arrow.

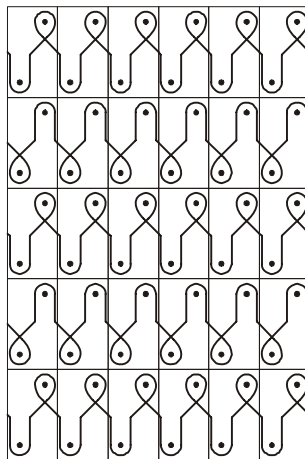


Figure 9. Full Cardigan

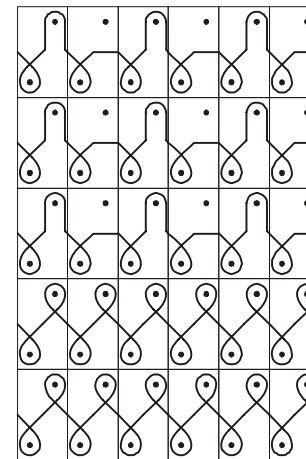


Figure 10. Miss and tuck stitches

With a different needle arrangement (the needle are set in a sequence of one high and one low butt needle) another type of design can be formed, this time combining tuck and miss stitches (Figure 10).

VI. CONCLUSIONS

The CorelDRAW application lets us create objects and save them as symbols. Symbols are defined once and can be referenced many times in a drawing.

Using CorelDRAW application we are drawing theoretical loop shape, in the same rectangular vertical and horizontal frame, as Corel line objects (face and reverse stitch, face and reverse tuck, miss stitch, face stitch and reverse tuck, face tuck and reverse stitch, rib stitches, front and reverse dropped stitches, front and rear transferred stitches).

The main aim is to create teaching method for universities and secondary technical schools, for easy drawing weft knitted fabric obtained on flat and circular knitting machines.

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* Lecturer PhD, Eng., "Gh. Asachi" Technical University, Iasi